LIMESTONE PRODUCTS

THE WESTERN LIME & CEMENT CO.
MILWAUKEE WISCONSIN

The Western Lime and Cement Company

Plants and Quarries located at the following Wisconsin points:

BRILLION
MARBLEHEAD
KNOWLES
NASBRO

HIGH CLIFF
HAMILTON
GREENLEAF

HAYTON
GRIMMS
QUARRY (VALDERS)
GREEN BAY

MAIN OFFICE: MILWAUKEE, WISCONSIN

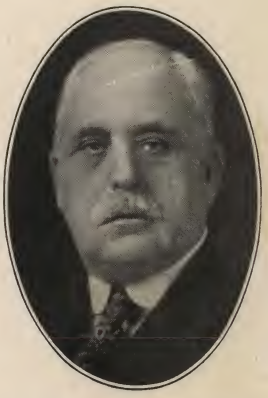
Foreword

AS A TOKEN of thousands of business friendships and in the hope that our friends may be interested in a pictorial review of our plants, a brief description of processes and in extended uses of our products, this pamphlet is submitted.

The Western Lime
and Cement Co.

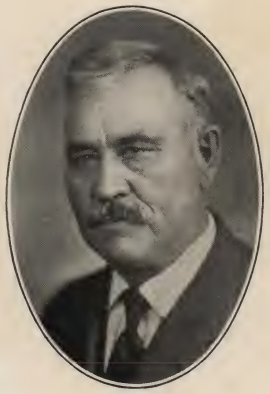
GEO. W. NAST, GEN. MGR.

O. W. ROBERTSON, PRESIDENT



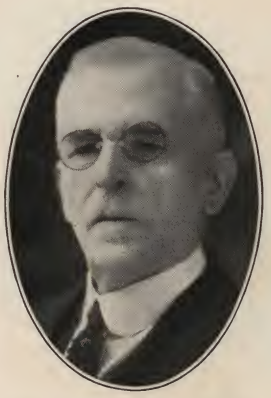
R. C. BROWN VICE-PRES

CHARLES WEILER



AUGUST NAST

V. F. NAST, SECRETARY



M. J. ASH, TREASURER

THE WESTERN LIME & CEMENT CO.
MILWAUKEE, WISCONSIN

Superintendents of Plants

Sales and Office Force, Milwaukee, Wis.

THE WESTERN LIME AND CEMENT CO.

STORAGE FOR CRUSHED STONE

CRUSHED STONE BINS

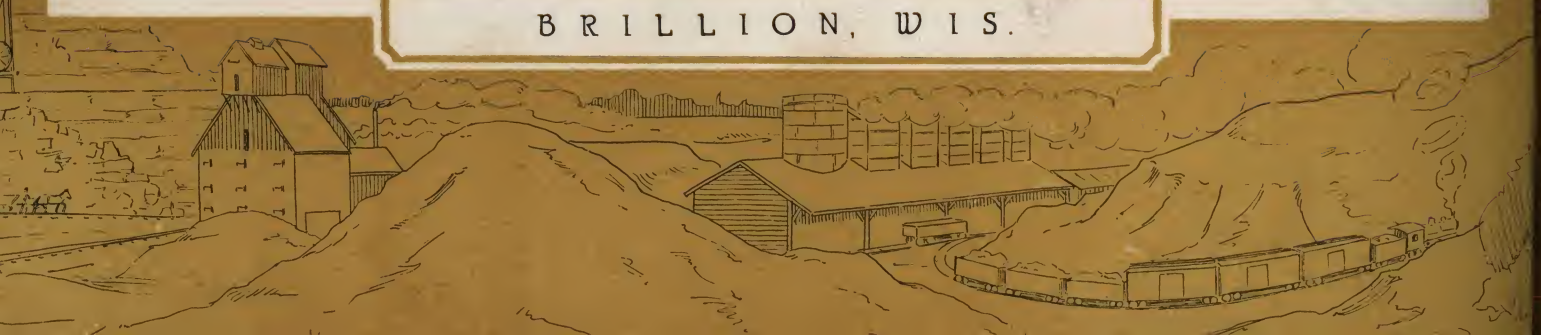
THE KILNS

F. MUMM,
GEN'L. SUPT.

HYDRATING PLANT

THE CREW

BRILLION, WIS.



THE WESTERN LIME AND CEMENT CO.

MAKING LIME

The abundant limestone deposits of Wisconsin supplying durable building stone and lime of excellent quality, have played an important part in the development of the State since early territorial days. Some of the quarries of The Western Lime & Cement Company have been operated continuously for well-nigh a century; today the operations of the company, greatly extended and modernized, are an important factor in the building industry of the middle west.

The history of The Western Lime & Cement Company is one of several consolidations which have made for the greatest economy in production and resulted in the most efficient service in lime offered anywhere.

THE STONE LEDGE

Lime is the great essential in the building trades. Some of the best lime in the United States, for construction purposes and outside of certain chemical uses, is the Magnesian Lime, produced in Wisconsin from the deposit of Dolomite that traverses Wisconsin from Madison to Sturgeon Bay, underlying comparatively level areas in most places, but forming the "rock-rib" of the bluffs at Iron Ridge and Fond du Lac, coming out as a miniature mountain at picturesque High Cliff on the Northeast corner of Lake Winnebago, then continuing again as a steep ridge past Green Bay, and finally forming the Door County peninsula and Islands, where the limestone is seldom more than three to four feet below the surface.

The remains of mussels and other animals, we are told by geologists, formed this limestone bed thousands of thousands of years ago, and were thousands of years doing it.

THE LEDGE AT HIGH CLIFF

And at Marblehead, indeed, the top ledge about thirty feet deep is entirely composed of these

ANIMAL REMAINS LIKE THESE FORM THE 800 FOOT LEDGE.

shells, so little compacted as to be distinctly visible.

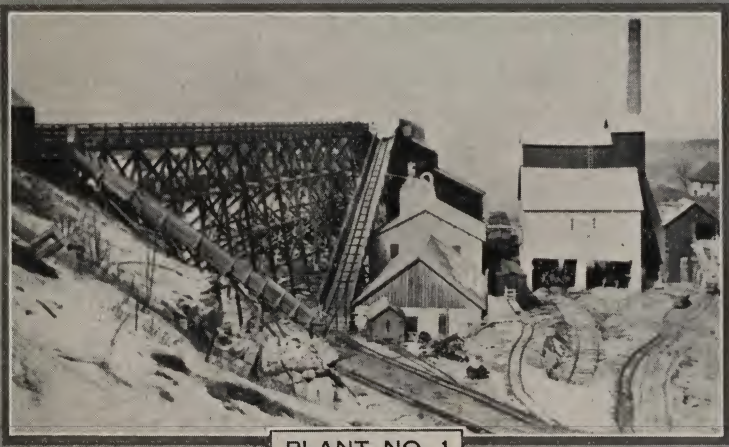
At Brillion, the state geological survey has determined that the limestone is over 800 ft. deep. At other points the depth of rock is not so well determined. Yet the limestone at all the quarries varies in different strata, and each requires different burning and acts differently in slacking.

Literally thousands of quarries have been opened in this huge deposit to find the best stone for lime, and the properties of The Western Lime & Cement Company include the greater part of the outcrop that will readily yield high-grade Magnesian Lime.

THE HOUSE PERFECT IS LIME PLASTERED

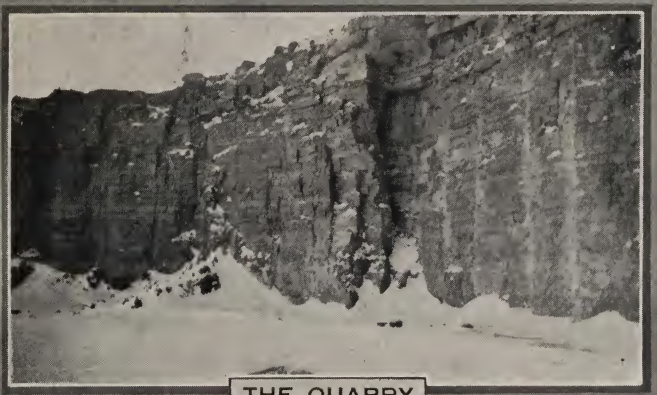
THE WESTERN LIME AND CEMENT CO.

FROM TOP OF CLIFF



PLANT NO. 1

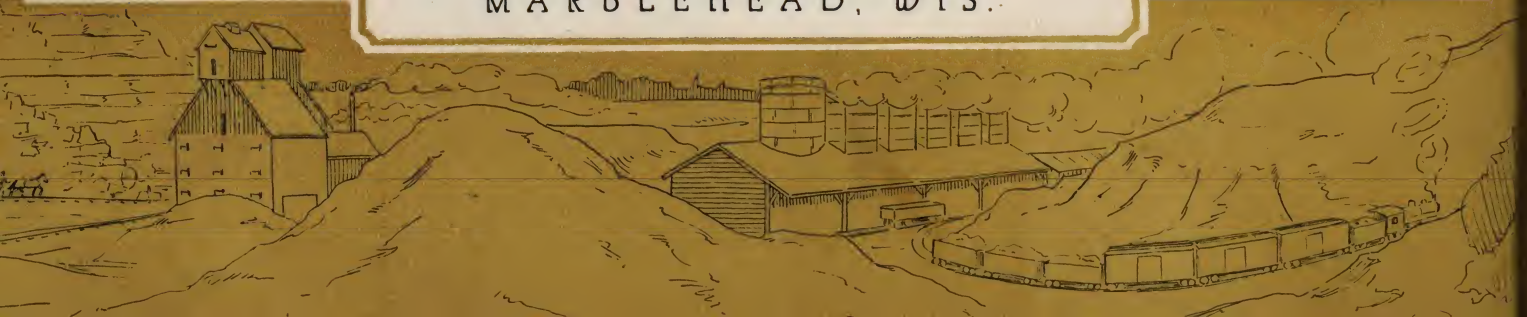
PLANT NO. 2



THE QUARRY

THE CREW

MARBLEHEAD, WIS.



STRIPPING

In quarrying lime rock the first operation is stripping or removing soil and inferior stone from the top of the ledge. At Brillion, Eden, Knowles and Nasbro, where the overburden is from 8 to 14 ft. deep, this is done by means of steam shovels and

REMOVING OVERBURDEN

dump cars. Where there is little top soil, as at Hayton, Grimms, Hamilton and other quarries, it is loaded by hand and carted away by horses. At all plants the ledge is thoroughly cleaned before blasting.

DRILLING AND BLASTING

Deep holes, six inches in diameter, are then drilled into the ledge, often over 90 ft. deep, as at Eden and Hamilton, where the 'face' or 'breast' has fully that height, over 30 ft. back from the brink, spaced 30—40 ft. apart, and when a row of these — 10 — 20 have been drilled, and all loose rock in front of the "face"

DRILLING 6" HOLES 90 FEET DEEP.

PLACING DYNAMITE IN BLAST HOLES.

has been removed, they are loaded each with 500 — 600 lbs. of high explosives. This enormous charge is set off at the same time by an electric battery

FIVE TONS OF DYNAMITE MOVING 40,000 TONS OF ROCK.

and suitable caps. Contrary to expectation there is no loud report from such an explosion, but the force of the powder is appalling. Four or five tons of dynamite in 20 such drill holes moves the bottom of the face out 100 feet or more and the top rock just drops into its place. The effect to the onlooker is that of a mountain crumbling to pieces.

Pieces of rock broken from the ledge by such deep hole blasts, that are still too large to be sledged by hand are drilled by a jackhammer drill, loaded with a stick of dynamite and broken in this way.

LOADING

Stone for the kilns is picked by hand — all 4" to 12" — and loaded into dump cars. Stone for crushing, all of which must be reduced to 2" is also loaded in

DUMPING ON TOP OF KILNS.

this way, but includes spauls and chips too small for lime. A high standard of kiln stone is thus maintained and utilizing the small stone, which would otherwise be wasted, for the crushers, makes

THE WESTERN LIME AND CEMENT CO.

CRUSHING PLANT, NASBRO

CRUSHING PLANT, KNOWLES

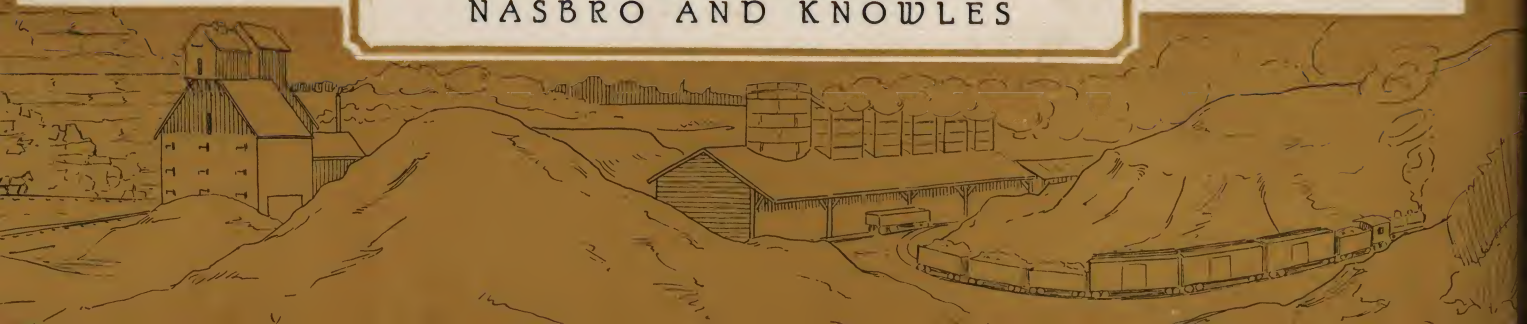
KILNS AND HYDRATING PLANT, NASBRO

KILNS, KNOWLES

CREW, NASBRO

CREW, KNOWLES

NASBRO AND KNOWLES



for economical production. Trains of dump cars and locomotives transport the stone to kilns and crushers,

GAS LOCOMOTIVE & DUMP CARS.

but old Dobbin, where the haul is short, still proves his value. And the star performer among the horses is "Old Bill", so wise that he can tell by the setting of a switch which way his load should go, and goes there. The noon whistle and the quitting whistle he knows as well as any of the men and quits work just as promptly and marches off to the barn.

OLD BILL, A WISE OLD TIMER.

THE KILNS

The kilns are vertical shafts of heavy masonry, with walls 7 ft. thick and 50 ft. high. The stone is dumped into the top. Two fires to each kiln are at the sides

DUMPING QUARRY STONE

of the shaft, maintaining an intense heat (2000° F.) above the arches. Finished Lime is drawn 8 or 10 feet below the fires and as it is drawn partly burned lime and stone above it settle down or are poked down. The stone placed in the top all gradually passes the firing zone. The process is continuous or rather intermittent as a "draw" of lime is made every four to six hours. The degree to which lime is burned

FIRING.

depends on the fire and the rate at which stone is passed through the shaft.

Our experienced firemen know just when to draw the finished lime and make room for a new batch of stone to approach the fires. Generally speaking, that Lime is best which still retains some core of unburned stone in the largest pieces. In the slacking box, lime having a percentage of unburnt core is apt to make as much putty as lime that is quite free from core, and certainly has better working qualities than when overburned, however slightly.

For the best quality of construction lime no fuel has ever equalled wood, and The Western Lime & Cement Company are fortunate in still having available a supply of kilnwood, though it is becoming increasingly expensive to procure this fuel. Wood stocks are accumulated mostly during the winter, when it can be hauled on sleighs to railroad cars in the north woods, and at each plant immense "yards" are maintained.

THE LIME FLOOR

THE WESTERN LIME AND CEMENT CO.

VIEW OF LAKE

QUARRY

HYDRATING PLANT AND KILNS

CREW

CRUSHER BINS

HIGH CLIFF, WIS.

THE WESTERN LIME AND CEMENT CO.

THE KILNS

THE QUARRY FACE 96 FT. HIGH

CRUSHING PLANT

THE CREW

HAMILTON, WIS.

THE WESTERN LIME AND CEMENT CO.

QUARRY AT HAYTON

QUARRY AT GREENLEAF

KILNS AT HAYTON

CRUSHING PLANT, GREENLEAF

CREW AT HAYTON

CREW AT GREENLEAF

GREENLEAF and HAYTON, WIS.

THE WESTERN LIME AND CEMENT CO.

6,000 CARLOADS, 90,000 CORDS OF WOOD ARE USED ANNUALLY.

SHIPPING FRESH LIME

As lime is drawn from the bottom of the kilns it has only partly cooled and is kept for a few hours on wheelbarrows or "buggies" until cool enough to load into wooden railroad cars. Lime, when exposed to the air, is apt to air-slake, especially in hot, sultry weather; it must be used as soon after burning as possible. In no case do we keep lime on the premises longer than 24 hours after drawing and yet in no case has an order been delayed longer than 48 hours. The large volume of business and the many plants enable The Western Lime & Cement Company to give such service on quick lime.

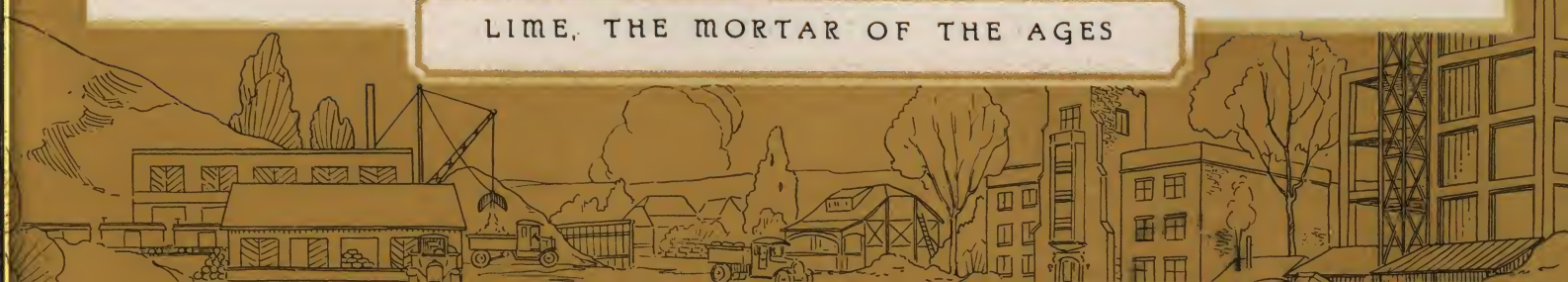
HYDRATING

While quick lime is quick to deteriorate in moist air, and must be kept in almost air-tight bins, Limate, the hydrated form, is a perfect stocker and keeps in its stout paper bags indefinitely. Lime as it comes from the kilns requires a certain percentage of water to slake it; excess water which is always added in the slaking box, will form a putty. In making Limate, just enough water is added for the chemical combination; no part is left unslaked and still there being no free water, no putty is formed. The fine powder will all pass through a 100 mesh sieve, and each particle is separate. When it gets to the job, the addition of water will immediately make the putty or paste. To do this hydrating, after passing through a gyratory crusher, a weighed amount of lime is mixed with a definite quantity of water, the mixture being controlled to within a fraction of one percent. Bagging is done by machines which automatically weigh each sack.

LIME IS SCIENTIFICALLY SLAKED IN THESE MACHINES TO MAKE LIMATE.

BAGGING LIMATE.

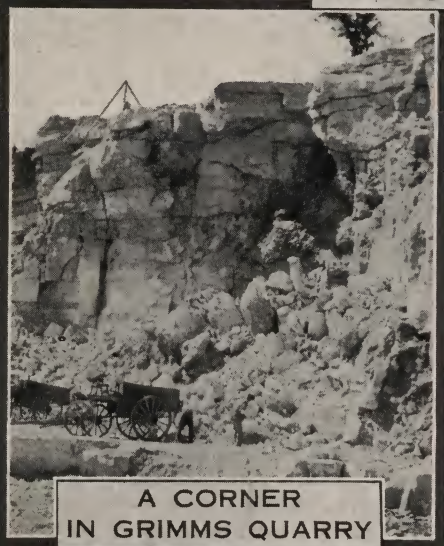
LIME, THE MORTAR OF THE AGES



THE WESTERN LIME AND CEMENT CO.

GRIMMS KILNS

KILNS AT QUARRY



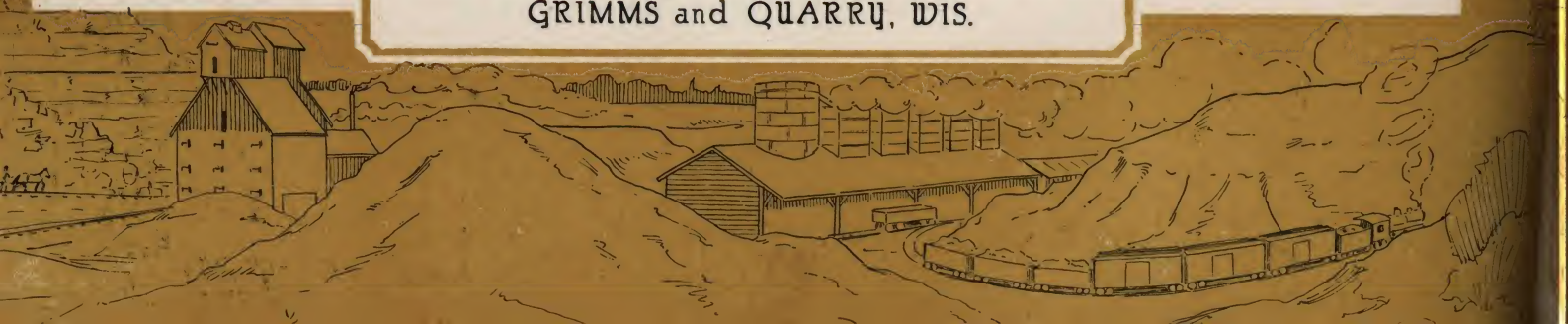
A CORNER
IN GRIMMS QUARRY

QUARRY AT QUARRY

CREW AT GRIMMS

CREW AT QUARRY

GRIMMS and QUARRY, WIS.



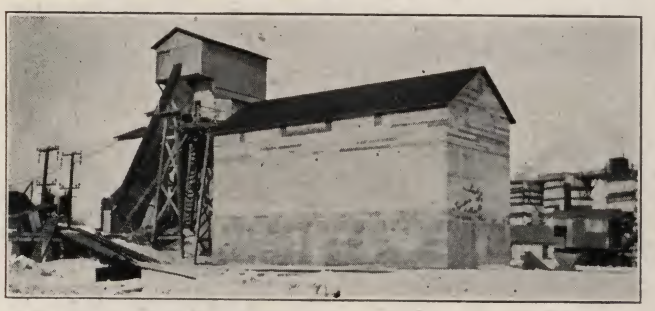
THE WESTERN LIME AND CEMENT CO.

STONE CRUSHERS

From the quarry, stone goes to the crushers as well as to the kilns. An initial gyratory crusher at each plant reduces the stone to practically 2–½" and a secondary gyratory completes the reduction to 2". Standard screens separate this product into 2"—1½" —1" and ⅜", and finer. Such plants are operated at all locations except at Grimms and Hayton.

AGRICULTURAL STONE

It has been said by competent authorities that two-thirds of the farm land of Wisconsin needs a coat of limestone a half inch deep or an equivalent in lime,



BIN TO STORE AGRICULTURAL STONE FOR WINTER SHIPMENT.

to overcome the acidity of the soil. The benefits of liming can hardly be over-estimated. Many agencies are at work to induce farmers to use limestone and lime more generally, as the question of keeping Wisconsin at the forefront in dairy products is largely one of neutralizing sour soils with limestone products. The Western Lime & Cement Company is prepared to meet a large part of this demand, with a by-product of the crushers, rescreened crusher sand, ten mesh and finer, equal, for acid neutralizing, to pure Calcium Carbonate.

Heretofore increase in agricultural production has been brought about largely by increased acreage. Further progress can be sought only in greater yield per acre, which now, in this comparatively new soil of the middle west is less than half of the yield of small grains in European countries! Dairying, as compared with grain farming, is a great aid in restoring soil fertility, but no amount of fertilizer will correct soil acidity. Limestone is the only material, practically available, to accomplish this.

NOT A FERTILIZER

Limestone is not in itself a fertilizer. One great essential to soil fertility is nitrogen and this can be gained from the air by nitrogen fixing bacteria. These bacteria thrive especially on leguminous plants. But both the bacteria and their hosts, the legumes, are very sensitive to acid soils. So that soil sweetening by liming does permit this process of fertilizing to go on and in that sense limestone is a fertilizer. The most valuable of these fertilizing crops are the most sensitive to acid, alfalfa, sweet clover, red and mammoth, alsike and crimson clovers and soybeans, in the order named.

THE GREAT NEED

From all information given out by soil experts, it seems safe to conclude that the yield of any field or forage crop on any soil that has been farmed 25 years will be increased at least 25 per cent by an application of limestone; that in the more acid, sandy soils the benefits of liming are still more apparent, increasing the yield, especially in legumes, 50 and 100 per cent, and there are large areas where an application of limestone is all that is needed to turn failure of the alfalfa or clover crop into success. Limestone alone can increase agricultural production in the middle west fifty percent and it is to the interest of everyone to spread the gospel of liming, — farmers, merchants, manufacturers, bankers.

SOME STATISTICS

The Western Lime and Cement Company are operating 54 kilns. Each kiln needs to be shut down on an average one month during the year for greater or lesser repairs to the fire brick lining. Outside of that kilns can be operated continuously and are actually fired day and night and Sundays, producing about 125 barrels of finished lime per day. The annual capacity is fully 2,000,000 barrels.

Hydrating Plants are operated at High Cliff, Brillion, Eden and Nasbro. The total capacity of the hydrators is 1700 barrels per day.

Crushing Plants are operated at Brillion, High Cliff, Eden (2), Greenleaf, Hamilton, Knowles and Nasbro. The capacity of each is about 250 tons per day.

All Plants, except Greenleaf, Knowles and Hayton are electrically equipped and it takes 60 motors, ranging from two to sixty horse-power to operate crushers, hydrators, conveyors, hoists, air compressors, etc.

Plug drilling at all plants is done by compressed

THE WESTERN LIME AND CEMENT CO.

STOCK PILE

KILNS

FIRING FLOOR

WEIGHING OUT LIME TO CARS

GREEN BAY, WIS.

air and for the large blasts each quarry operates a well drill.

The number of employes at the plants varies between 400 and 500. Lime is burned at all locations throughout the year. Of late years the winter demand has steadily increased, permitting steadier, less seasonal operation in lime.

Crushed Stone, which moves virtually only during five or six summer months, necessitates the employment of some additional labor during the road building season.

As most of the plants are located away from cities of any size, houses are provided for the workmen and of these the company owns 128.

COMPANY HOUSES AT GREENLEAF

COMPANY HOUSES AT QUARRY

GREEN BAY PLANT

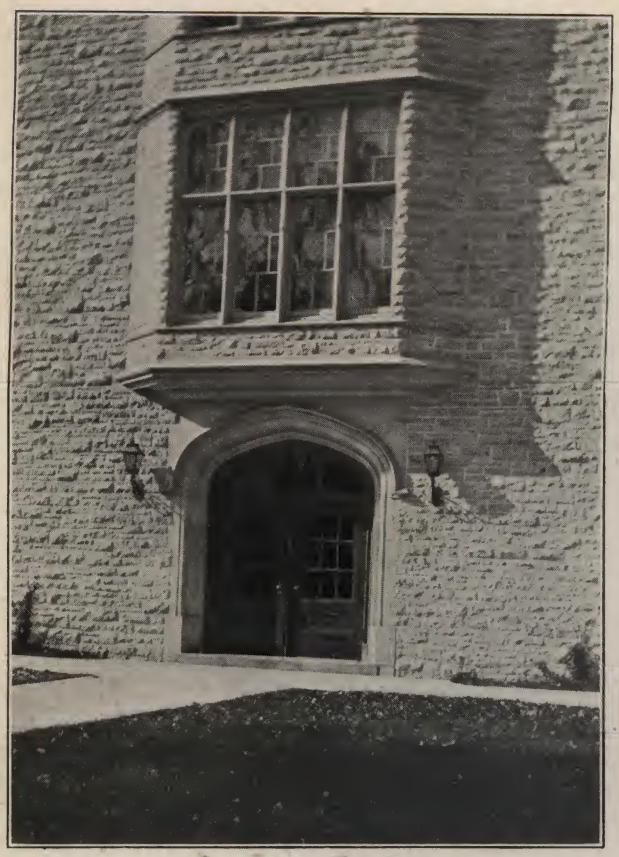
WM. D. STUCK
SUPT. OF
GREEN BAY PLANT

While the Wisconsin Magnesian Lime is superior for all construction purposes, there are some chemical uses in which the magnesium content is detrimental, as in certain processes in paper making, in water- softening, etc. To meet the demand for this chemical lime The Western Lime and Cement Company have recently constructed a modern three kiln plant at Green Bay, Wis., using high calcium rock, boated from Michigan quarries. Some of the purest calcium stone in the northwest is used for the purpose. There are no known deposits of this class of rock in Wisconsin.

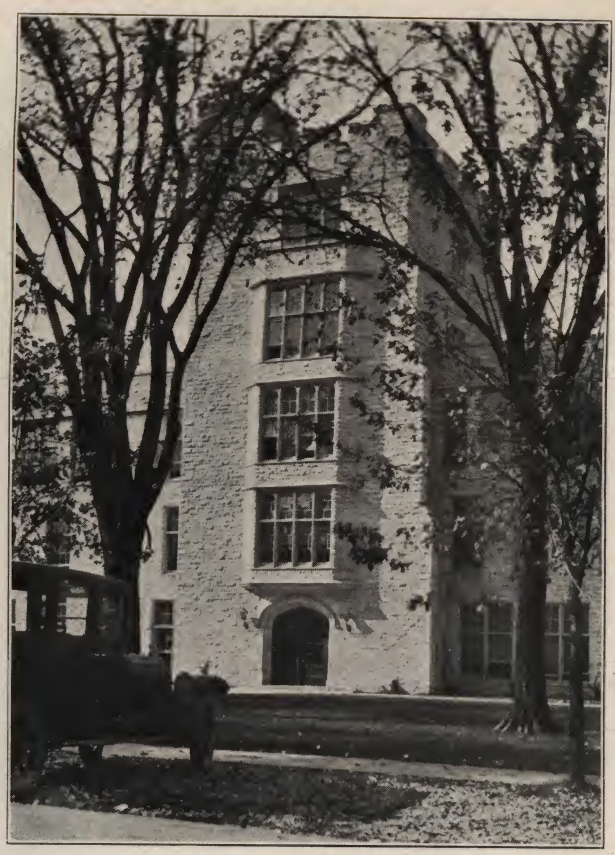
This plant is all of concrete and steel construction and a model of convenience. It is located on a dock having 500 feet frontage on the Fox River, especially constructed and capable of carrying a year's supply of the limestone. Self-unloading vessels deposit their cargoes of 6,000 — 10,000 tons in lofty piles — within 4 to 6 hours.

This is our only plant at which coal is the fuel. Owing to the character of the calcium rock, as well as the uses to which the lime is put, the intenser heat of the coal calcines the stone without detriment to the product. Provision has been made in the building for additional kilns as they may be required.

THE WESTERN LIME AND CEMENT CO.



Marblehead Stone in the New Fond du Lac High School — The Marblehead quarry furnishes an exceptionally dense and durable stone of excellent color.



Detail of High School Building at Fond du Lac — Openings are trimmed with sawed Bedford Limestone with which Marblehead stone matches beautifully.

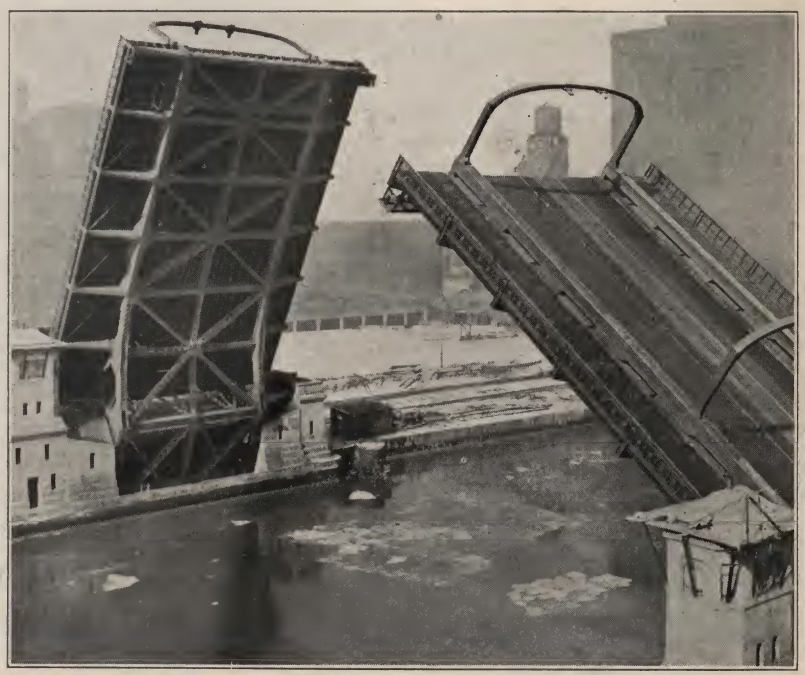
U. S. Mine Experimenting Station, University of Minnesota, Minneapolis, Minn. Lime Concrete and Lime Mortar used throughout.

LIMATE FOR BETTER CONCRETE

THE WESTERN LIME AND CEMENT CO.

A Lime-Stucco Residence. "Limate Stucco will stand up longer without cracking or soiling and is far more economical."

Field Museum of Natural History, Chicago — Lime Plaster used throughout. Careful and exhaustive study of all plastering materials lead to the selection of lime. Few builders can undertake such research but all can profit by the thorough investigation made in this case.



Madison Street Bridge Chicago, Ill. — The counterweight pits extend 34 ft. below water level. *Limate* made them "absolutely water tight."

NO PERFECT STUCCO WITHOUT LIME

THE WESTERN LIME AND CEMENT CO.

Commercial National Bank, Fond du Lac, Wis. — *Limate* in all concrete. It insures water tightness, density, and uniform color; the cost of Limate is more than offset by the ease of working.

Concrete Road—Winnebago County—From the different crushing plants, several hundred miles of concrete roads have been supplied with crushed stone. Other things being equal, crushed stone in concrete makes it 50% stronger than with round pebbles.

Flag stones in Landscape Architecture — Wonderful rustic effects can be attained with these thin sheets of stone from Marblehead. In thickness they range from 1″ up. Even the thinest layers are dense and durable stones that will resist weathering.

LIME, THE MORTAR OF THE AGES

What Limestone or Lime will do for Crops. Photographic views can show only a hint of the real difference which is seldom less than 50 per cent in yield and often amounts to changing failure to success. Nowadays there is no profit in a field that does not produce big crops.

Every Dollars worth of Lime produces two to ten dollars worth of increased crop. The word "Lime" here is used to cover all forms, quick lime, hydrate or the unburnt stone. Two tons of stone are about equal to one ton of lime. Unless transporting to the field is very costly, the less concentrated but much cheaper stone is more economical, and is the form generally used.

Schwade Printing Co., Milwaukee